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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/146,839	09/03/1998	ANAND SRINIVASAN	MI22-1017	9907

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EXAMINER

MAI, ANH D

ART UNIT PAPER NUMBER

2814

DATE MAILED: 03/25/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Applicati n No.

09/146,839

Applicant(s)

SRINIVASAN ET AL.

Examiner

Anh D. Mai

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 January 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,4-8,10,13-19,22-28,36,38,39,43 and 44 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,4-8,10,13-19,22-28,36,38,39,43 and 44 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 22, 2002 has been entered.

### ***Response to Amendment***

2. The amendment filed August 29, 2000 and June 25, 2001 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: the temperature “from about 500 °C *but less than 630 °C*” (claim 18, line 4; claim 38, line 3; claim 43, line 3); .

Applicant is required to cancel the new matter in the reply to this Office Action.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 18, 19, 38, 39, 43 and 44 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to

Art Unit: 2814

reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

There does not appear to be a specific written description of the claim limitation temperature of "*less than 630 °C*" in the application as filed.

At best, the specification disclosed: "[T]emperature of the substrate within the reaction chamber is preferably maintained at from about 400 °C to about 700 °C, and more preferably maintained at about 500 °C" (page 5, lines 3-5).

There is no such temperature of 630 °C as newly added.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 4-7, 10, 16, 17 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vassiliev (U.S. Patent No. 5,876,798).

Vassiliev teaches a method of forming a fluorine doped insulating material substantially similar as claimed including:

providing a substrate (3) within a reaction chamber, the reaction chamber controlled within a range of temperatures above 400 °C but not greater than about 700 °C;

providing reactants comprising silicon, fluorine and ozone within the reaction chamber;  
and

Art Unit: 2814

depositing an insulating material, comprising fluorine, silicon and oxygen onto the substrate from the reactants, wherein the depositing occurs with a plasma being present in the reaction chamber.

Regarding the deposition rate, it is well known in the art that the deposition rate is readily determined by the input of the reactant gases. The depositing rate does not appear to be critical.

Given the teaching of the reference, it would have been obvious to one having ordinary skill in the art at the time of invention to determine the optimum deposition rate of the fluorine doped insulating material. See *In re Aller, Lacey and Hall* (10 USPQ 233-237) "It is not inventive to discover optimum or workable ranges by routine experimentation."

With respect to claims 4-6, the reactants of Vassiliev comprises silicon and fluorine within a common molecule (FTES).

With respect to claim 7, the fluorine in the insulating material of Vassiliev is present in Si-F bonds.

With respect to claim 10, the pressure within the reaction chamber of Vassiliev is within the claimed range.

With respect to claims 16 and 17, the reactants of Vassiliev comprise a molecule that includes both Si and F (FTES), and another molecule that includes Si without F (TEOS).

With respect to claim 36, the deposition rate has been discussed above.

Art Unit: 2814

5. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vassiliev '798, as applied to claim 1 above, and further in view of Homma (U.S. Patent No. 5,288,518).

Vassiliev teaches all of the features of the claim with the exception disclosing the atomic percentage of fluorine in the insulating material.

However, Homma '518 teaches the atomic percentage of fluorine in the fluorine doped insulating material is within the claimed range.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to form fluorine doped insulating material of Vassiliev having the atomic percentage of fluorine as taught by Homma to achieve a low dielectric constant.

Further, no criticality has been established.

Given the teaching of the reference, it would have been obvious to one having ordinary skill in the art at the time of invention to determine the optimum atomic percentage of fluorine in the fluorine doped insulating material. See *In re Aller, Lacey and Hall* (10 USPQ 233-237) "It is not inventive to discover optimum or workable ranges by routine experimentation."

6. Claims 13-15 and 22-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vassiliev '798 as applied to claims 1 above, and further in view of Kirchhoff et al. (U.S. Patent No. 6,057,250).

With respect to claims 13-15, 23 and 25, Vassiliev teaches all of the features of the claim with the exception of further includes boron and phosphorous in the reactant gases.

However, Kirchhoff teaches forming fluorine doped insulating material further includes boron and phosphorous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to include boron and phosphorous in the fluorine doped insulating material of Vassiliev as taught by Kirchhoff to lower the reflow temperature.

With respect to claims 22 and 26, the boron-containing precursor of Kirchhoff is TEB.

With respect to claims 24 and 27, the phosphorous-containing precursor of Kirchhoff is TEPO.

With respect to claim 28, the phosphorous-containing precursor and boron-containing precursor of Kirchhoff is TEPO and TEB.

7. Claims 18, 19, 38, 39, 43 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vassiliev (U.S. Patent No. 5,876,798).

As best understood by the examiner, Vassiliev teaches a method of forming a silicon oxide having Si-F bonds substantially similar as claimed including:

providing a reaction chamber at a temperature in excess of 400 °C;

positioning a substrate (3) within the reaction chamber;

providing an ozone comprising reactant and a precursor having Si-F bonds to the substrate within the reaction chamber;

while providing the ozone comprising reactant and the precursor having Si-F bonds to the substrate, providing a plasma within the reaction chamber; and

causing a silicon oxide having Si-F bonds, to deposit onto the substrate within the reaction chamber. (See Figs. 1-4).

Art Unit: 2814

Regarding the deposition rate, it is well known in the art that the deposition rate is readily determined by the input of the reactant gases. The depositing rate does not appear to be critical.

Given the teaching of the reference, it would have been obvious to one having ordinary skill in the art at the time of invention to determine the optimum deposition rate of the fluorine doped insulating material. See *In re Aller, Lacey and Hall* (10 USPQ 233-237) "It is not inventive to discover optimum or workable ranges by routine experimentation."

With respect to claim 19, the precursor having Si-F bonds of Vassiliev is FTES.

With respect to claims 38, 39, 43 and 44, insofar as understood by examiner, the deposition temperature and pressure in the reaction chamber of Vassiliev is within the claimed range.

Further, the temperature range does not appear to be critical.

Given the teaching of the references, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to determine the optimum temperature of the deposition chamber. See *In re Aller, Lacey and Hall* (10 USPQ 233-237) "It is not inventive to discover optimum or workable ranges by routine experimentation."

### ***Response to Arguments***

Regarding the telephone interview: see Paper No. 17.

### **Objection under 35. U.S.C. 132 and Rejection under 35. U.S.C. 112, first paragraph:**

With respect to *in re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976). The limitation "between 35% and 60%" meet the description requirement because the value of 36%



Art Unit: 2814

explicitly disclosed in the specification. Furthermore, the value of 35% is considered to be close to the disclosed value of 36%. In the instant application, the temperature 630 °C is neither supported by the specification as filed nor close to any disclosed temperatures. It is true that “630 °C” is within 400 °C to 700 °C, but picking a number, within a range, out of thin air requires written disclosure.

Since each claim value having its own merit, the temperature from about 400 °C to 700 °C, indicated that the deposition of the insulating material are taking place. At the preferred temperature at about 500 °C, some thing *may be* happened such as faster or better insulating material was formed.

Did any thing other than depositing the insulating material take place at 630 °C ?

Obviously not. This temperature is just happen to be between 400 and 700 °C and seem to be a nice number if at all. The terms “about” or “in excess of” are considered to be “approximate” which is give or take a few. However, “630 °C” is nowhere near 400, 500 or 700 °C.

The objection and rejection are, therefore maintained.

**Rejection Under 35 U.S.C. 103.**

Claims 1, 4-7, 10, 16, 17 and 36.

Applicant asserts that the CVD process of Vassiliev is conducted in the ABSENCE OF PLASMA. This assertion is erroneous and not a fact. The matter at hand is whether or not Vassiliev has ever deposited doped silicon oxide layer in the presence of plasma. The evidence

Art Unit: 2814

shows that depositing fluorine doped silicon oxide **in the present of plasma** is clearly taught by Vassiliev (col. 6, ll. 8-14).

Upon reviewing claims 1-15 of Vassiliev, one, applicant included, should have recognized that the term “ABSENCE OF PLASMA” could not be found.

Vassiliev teaches “[S]imilarly, methods such as plasma enhanced deposition **must not be incorporated** even though they **may offer some short term advantages such as higher deposition rates**” (col. 6, ll. 4-7). The passage explicitly indicated that Vassiliev has processed an insulating material deposited in the present of plasma. Nothing in Vassiliev supports the Applicant’s conclusion that Vassiliev teaches away from claims 1 and 18.

**Vassiliev ‘798 in view of Homma and Vassiliev ‘798 in view of Kirchhoff.**

As discussed above, Vassiliev teaches all the features of claims 1, therefore, the combination of the references clearly renders the dependent claims 8, 13-15 and 22-28 obvious.

***Conclusion***

1. All claims are drawn to the same invention claimed in the application prior to the entry of the submission under 37 CFR 1.114 and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the application prior to entry under 37 CFR 1.114. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action after the filing of a request for continued examination and the submission under 37 CFR 1.114. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

Art Unit: 2814


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (703) 305-0575. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

A.M  
March 20, 2002

  
ANH D. MAI  
Supervising Patent Examiner  
Technology Center